

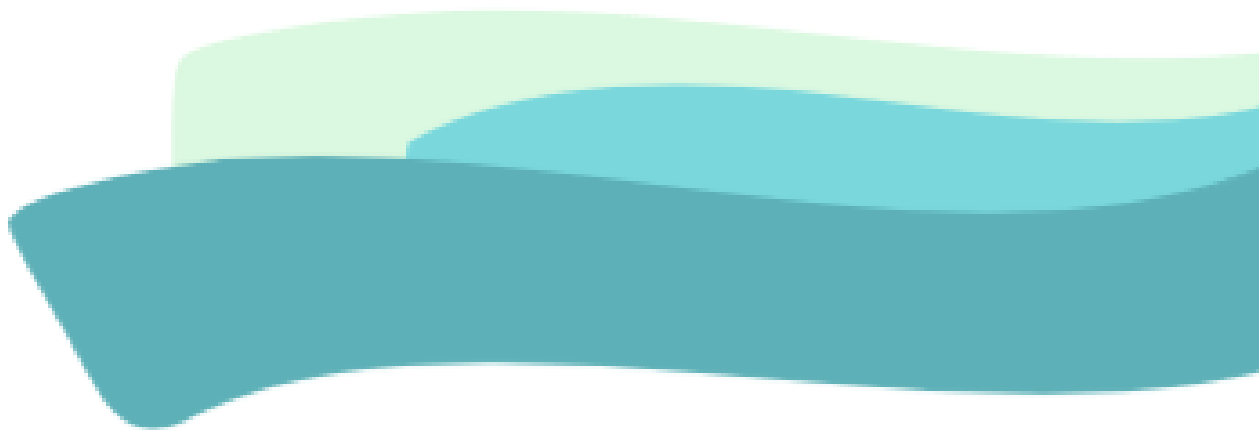
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Associação Portuguesa de Oceanografia

6 e 7 de Maio 2016

S. Pedro de Moel

Encontro de Oceanografia





ASSOCIAÇÃO PORTUGUESA DE OCEANOGRAFIA

Constituída em 2013 por reformulação da antiga Associação Portuguesa de Paleoceanografia, a **Associação Portuguesa de Oceanografia** (APOCEAN) é uma sociedade científica cujos principais objectivos são:

- O intercâmbio científico através de encontros e workshops.
- Diagnosticar e encontrar soluções para os problemas comuns a quem investiga o oceano.
- Promover a interdisciplinaridade juntando cientistas de várias áreas.
- Apoiar a internacionalização da oceanografia portuguesa, interagindo com associações similares de outros países e com organismos internacionais.
- Apoiar a divulgação para o público geral da investigação praticada em Portugal.
- Contribuir para uma melhor formação em oceanografia junto das Universidades.
- Divulgar a importância social e económica do estudo dos oceanos.
- Promover uma visão atual, integrada e cientificamente fundamentada da oceanografia.
- Participar na definição de políticas de investigação dos oceanos.
- Contribuir para a representação portuguesa em organismos internacionais de investigação e exploração do oceanos.

A associação já está representada na quase totalidade de instituições, Laboratórios e Unidades de Investigação com actividade no domínio da Oceanografia ou em campos de investigação ligados ao oceano.

Este ano a APOCEAN promove o **Encontro Nacional de Oceanografia**, nos dias 6 e 7 de Maio em S. Pedro de Moel, concelho da Marinha Grande.

Encontro de Oceanografia 2016



Encontro de Oceanografia 2016

S. Pedro de Moel

Organização

apocean – Associação Portuguesa de Oceanografia

Email: encontrooceanografia@gmail.com

Comissão Organizadora:

Álvaro Peliz

Ana Machado

Rui Pedro Vieira

Sandra Plecha

Teresa Rodrigues



Alojamento e Como Chegar

São Pedro de Moel é uma localidade do concelho da Marinha Grande, com origens muito antigas e considerada uma das mais pitorescas praias da região Centro costeira do País.

O Hotel Mar e Sol, situado na praia de S. Pedro de Moel, e onde decorrerá o Encontro, dispõe de quartos duplos e individuais, com buffet de pequeno-almoço incluído.

O alojamento é em regime de quarto duplo, mas caso pretenda quarto individual será aplicada uma taxa adicional de 25€. No caso de preferência por quarto duplo, e na ausência de indicação de companheiro de quarto, a organização reserva-se ao direito de distribuir os participantes pelos quartos.

São Pedro de Moel localiza-se a 10 km da Marinha Grande e a 20 km de Leiria.

De carro:

A1: sair em Leiria, seguir para Marinha Grande e S. Pedro de Moel.

A8: sair em Marinha Grande Sul, zona industrial, e seguir para S. Pedro de Moel.

Comboio: a CP disponibiliza comboios desde Lisboa e Porto para a Marinha Grande.

Rede Expressos: serviço regular desde Lisboa e Porto para a Marinha Grande.

Autocarro Marinha Grande – S. Pedro de Moel: consultar horários das carreiras interurbanas.



ASSEMBLEIA GERAL DA ASSOCIAÇÃO PORTUGUESA DE OCEANOGRAFIA

Caros sócios da APOCEAN,

A Assembleia Geral da Associação Portuguesa de Oceanografia – APOCEAN, a reunir em sessão ordinária, na sala Rainha Santa Isabel (Piso 4) do Hotel Mar e Sol, Av. da Liberdade Nº1, 2430-501 São Pedro de Moel, no dia 7 de Maio de 2016, pelas 11:30 horas, com a seguinte ordem de trabalhos:

1. Informação aos sócios sobre as atividades desenvolvidas em 2015
2. Admissão de novos sócios
3. Apresentação/aprovação de contas do ano de 2015
4. Planos de atividades e orçamento para 2016
5. Outros assuntos.

Chamo a vossa atenção para a importância da participação e envolvimento dos associados na gestão da APOCEAN.

João Miguel Dias

O Presidente da Mesa da Assembleia Geral



Programa

Sexta-feira, 6 de Maio

10h30m – 11h30m **Recepção**

11h30m – 11h45m **Sessão de abertura**

Sessão I

Moderador: José Hipólito Monteiro

Palestra Convidada: Oceanografia Química

11h45m – 12h30m Stable Isotope Signatures of Water Masses from the North Atlantic's subpolar to subtropical gyre

Voelker AHL, van Geldern R, Salgueiro E, Waniek J

Paleoceanografia e Clima I

12h30m – 12h45m Past Climate Variability during the last 1 Ma in the southwestern Iberian Margin: imprints of the past circulation modes

Rodrigues T, Hodell DA, Naughton F, Alonso-Garcia M, Grimalt JO, Abrantes F

12h45m – 13h00m The diversity of millennial-scale cooling events in southwestern Europe during MIS 11.

Oliveira D, Desprat S, Rodrigues T, Naughton F, Hodell DA, Trigo R, Abrantes F, Sánchez Goñi MF

13h00m – 14h30m **Almoço**



Sessão II

Moderadora: Fátima Abrantes

Paleoceanografia e Clima II

- 14h30m – 14h45m Past circulation along the Western Iberian margin: a time slice vision from the last glacial to the Holocene
Salgueiro E, Naughton F, Voelker AHL, de Abreu L, Alberto A, Rossignol L, Duprat J, Magalhães VH, Vaqueiro S, Turon J-L, Abrantes F
- 14h45m – 15h00m Climate variability across the last deglaciation in western Iberia and its margin
Naughton F, Rodrigues T, Salgueiro E, Sanchez Goñi MF, Desprat S, Costas S, Gomes S, Bronk-Ramsey C, Duprat J, Michel E, Rossignol L, Zaragosi S, Prabhu CN, Oliveira D, Voelker AHL, Abrantes F
- 15h00m – 15h15m Climate change decouples oceanic primary and export productivity and organic carbon burial
Lopes C, Kucera M, Mix AC
- 15h15m – 15h30m Corais de águas frias revelam variação da circulação intermédia durante o último ciclo climático na zona SE do Golfo do México
Matos L, Wienberg C, Schmiedl G, Frank N, Abrantes F, Cunha MR, Hebbeln D

Oceanografia Geológica

- 15h30m – 15h45m Iceberg plough marks in the Estremadura Spur pockmarks field
Magalhaes VH, Duarte D, Terrinha P, Abrantes F, Salgueiro E, Madureira P, Ribeiro C, Lavoile C, Correia R, the PES project scientific team

Oceanografia Costeira

- 15h45m – 16h00m Oceanografia costeira e dinâmica litoral

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Monteiro JH

16h00m – 17h00m Sessão de posters

17h00m – 17h30m Pausa para café

Sessão III

Moderadora: Fátima Sousa

Oceanografia Física I

17h30m – 17h45m Numerical simulation of sea level anomalies induced by atmospheric perturbations

Plecha S, Peliz A, Antunes C, Matias L

17h45m – 18h00m Estimation of the Atlantic-Mediterranean netflow variability: from subinertial to inter-annual time-scales

Guerreiro CT, Peliz A, Miranda PM

18h00m – 18h15m Processos oceanográficos e distribuição espaço-temporal das áreas de pesca: um caso de estudo

Lamas L, Oliveira PB, Pinto JP, Almeida S, Deus R, Almeida N, da Silva AJ

Palestra Convidada: Robótica



18h15m – 19h00m Networked vehicle systems for ocean operations: from concepts to experimentation
Sousa JT

19h00m – 20h00m **Tempo Livre**

20h00m **Jantar do Encontro**

Sábado, 7 de Maio

Sessão IV

Moderador: Joaquim Dias

Palestra Convidada: Oceanografia Física

9h00m – 9h45m Sistemas Operacionais de modelação numérica na margem W Ibérica.
Dubert J, Nolasco R, Cordeiro N, Pilczynski K

Oceanografia Física II

9h45m – 10h00m Descargas de Águas Subterrâneas nos Olhos de Água (Algarve) –
Resultados das campanhas CTD
Frazão H, Sousa FM, Equipa do Projeto FREEZE

10h00m – 10h15m Flows around the Azores Plateau: Evidence of intermediate depth closed
circulations.
Peliz A

10h15m – 10h30m Circulação costeira no barlavento Algarvio no verão de 2015
Oliveira PB, Santos M, Moita MT, Amorim A

10h30m – 11h00m **Pausa para café**



Sessão V

Moderadora: Ana Teles-Machado

Oceanografia Física III

11h00m – 11h15m Connecting pathways across the northeast Atlantic Ocean

Sala I, Lima MJ, **Caldeira RMA**

11h15m – 11h30m Fridtjof Nansen

Peliz A

11h30m – 13h00m Assembleia Geral APOCEAN

13h00m – 14h30m Almoço

Sessão VI

Moderador: Paulo Relvas

Palestra Convidada: Oceanografia Biológica

14h30m – 15h15m Deciphering the Deep-C: approaches to investigate biological connectivity in the deep sea

Cunha MR

Oceanografia Biológica

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- 15h15m – 15h30m Exploring the submarine canyons' scientific landscape: visualizing what we know
Matos FL, Ross SW, Huvenne VAI, Davies JS, Cunha MR
- 15h30m – 15h45m Larval dispersal in the Gulf of Cadiz: a modelling exercise for the marbled rock crab *Pachygrapsus marmoratus*
Pires RFT, Peliz Á, Pan M, Santos AMP, Boutov D, dos Santos A
- 15h45m – 16h00m New insights on deep-sea fish community structure along environmental gradients
Vieira RP, Chung M-T, Cunha MR, Trueman CN
- 16h00m – 16h30m Sessão de encerramento com entrega do prémio**
- 16h30m – 17h00m Lanche**



RESUMOS

Palestra Convidada: Oceanografia Química

STABLE ISOTOPE SIGNATURES OF WATER MASSES FROM THE NORTH ATLANTIC'S SUBPOLAR TO SUBTROPICAL GYRE

Antje Voelker^{1,2}, van Geldern, R³, Salgueiro E^{1,2}, Waniek, J⁴

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The stable isotope values of fresh or marine waters can be used to evaluate changes in the hydrological cycle, which in the marine environment relates mostly to more/less evaporation/precipitation in the region where a water mass is formed. The global hydrological cycle has intensified during the last decades as reflected by the increased salinity in the surface waters of evaporation dominated regions, such as the Atlantic's subtropical gyres, and enhanced freshening in precipitation dominated regions (Durack *et al.*, 2012). Evaluating how these changes affected the stable isotope signatures of water masses and isotope/salinity mixing lines is, however, hampered by the scarcity of available data. In the years between the GEOSECS program (early 1980's) and the ongoing GEOTRACES program, only few hydrographic campaigns collected seawater samples for stable isotope analyses, in particular in the eastern North Atlantic basin. To fill this gap of understanding the distributions of stable isotopes in the NE Atlantic and their relationship to the prevailing water masses, $\delta^{18}\text{O}$ and δD profiles were generated along intersecting hydrographic sections: 1) the OVIDE 2010 section from the Reykjanes ridge to the Portuguese margin; 2) the Iberia-Forams transect along the western and southern Portuguese margin; 3) the GEOTRACES GA03_e section from the Portuguese margin to the Azores front region near Madeira and southward to the Cape Verde islands; and 4) across the Azores Front near Madeira. In this presentation we will look at the distribution of the isotopic signatures along the sections, the different water masses identified and how the isotopic signal of a water mass might change with distance from the source region. Furthermore,

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potential mixing line changes between the subpolar and subtropical gyre will be evaluated.



Palestra Convidada: Robótica

NETWORKED VEHICLE SYSTEMS FOR OCEAN OPERATIONS: FROM CONCEPTS TO EXPERIMENTATION

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Unmanned ocean and air vehicle systems are already delivering new capabilities for ocean operations. But this is just the beginning. New technological developments in computation, communications, control, sensing, and materials will dramatically impact the design of unmanned vehicle systems for maritime operations. This will give rise to new capabilities and new concepts of operation.

This talk presents the vision for future unmanned ocean operations developed by the University of Porto Laboratório de Sistemas e Tecnologias Subaquáticas (<http://www.lsts.pt/>), describes the vehicles, tools, and technologies under development to achieve this vision, and discusses large scale field experiments where these developments are put to test.

The vision for the role of networked vehicle systems in future deployments is outlined and contrasted to the current practice in deployments of unmanned ocean vehicles. In this vision, networked vehicle systems are composed of physical and computational entities with (coupled) physical and computational dynamics and compositional dynamic structure. Dynamic structure delivers novel system's level properties that cannot be found in the constituent physical and computational entities.

The LSTS has been developing air and ocean vehicles, drifters, fish markers, and a software framework to achieve this vision. The award winning Light Autonomous Underwater Vehicle is now in its fifth generation. The LSTS control architecture for networked vehicle systems has off-board and on-board components which are implemented with the open source LSTS Neptus-IMC-Dune software tool chain (<http://www.lsts.pt/toolchain>) for mixed-initiative control of unmanned ocean and air vehicles operating in communications challenged environments with support for Disruptive Tolerant Networking (DTN) protocols. Neptus is a distributed command, control, communications, and intelligence framework for operations with networked vehicles, systems, and human operators. IMC is a communications protocol

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that defines a common control message set understood by all types of LSTS nodes (vehicles, consoles or sensors) in networked environments, thus providing for standard coupling of heterogeneous components in terms of data interchange.

Dune is the vehicle on-board software. Dune has also been integrated with the deliberative onboard planning system TREX.

The LSTS has been organizing in cooperation with the Portuguese Navy the international Rapid Environmental Picture (REP) annual exercise to test and evaluate new systems and technologies, to develop new concepts of operation, and to promote inter-operability and long term cooperation. The exercise provides a unique setting for refining the LSTS vision, as well as supporting tools and technologies.

Palestra Convidada: Oceanografia Física

SISTEMAS OPERACIONAIS DE MODELAÇÃO NUMÉRICA NA MARGEM W IBÉRICA

Jesús Dubert, Nolasco R, Cordeiro N, Pilczynski K

Departamento de Física e CESAM, Universidade de Aveiro

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Será realizada uma breve revisão dos sistemas operacionais atualmente em funcionamento na margem W Ibérica, de forma a mostrar as possibilidades de utilização dos produtos resultantes destes diferentes sistemas.

Será promovida uma discussão sobre estes, em particular sobre quais as necessidades da comunidade científica, para utilizar estes sistemas operacionais.

Alguns trabalhos aplicados, em que são utilizadas variáveis oceanográficas, serão apresentados.

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Palestra Convidada: Oceanografia Biológica

**DECIPHERING THE DEEP-C: APPROACHES TO INVESTIGATE
BIOLOGICAL CONNECTIVITY IN THE DEEP SEA**

Marina R Cunha

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Paleoceanografia e Clima

PAST CLIMATE VARIABILITY DURING THE LAST 1 MA IN THE SOUTHWESTERN IBERIAN MARGIN: IMPRINTS OF THE PAST CIRCULATION MODES

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Mid-Pleistocene Transition (MPT) is the transitional period occurring between the low-amplitude and high-frequency (41ka obliquity-forced) to high amplitude and low-frequency (100ka eccentricity-forced) that modulated the glacial/interglacial cycles. Here we reconstructed Sea Surface Temperature (SST) and past ocean circulation changes for the last 1Ma in the Iberian margin site U1385 “Shackleton site (IODP Expedition 339), a key location for understanding past climate changes. We propose to evaluate the response of long term orbital induced changes on the North Atlantic mid-latitudes. The main orbital changes occurred during the interval 900-650 ka associated with the MPT. At long-term the 900 ka event was record as a prominent cooling and mark the onset of strong glaciations in the North Atlantic. The great change in surface and deep-water circulation occurred at 650ka associated with the end of the MPT and the established quasi-periodic “100 kys cycles”. The comparison between the Iberian margin and other available paleoclimate record from north Atlantic allow us to recognize four different surface circulation modes due to the different position of the arctic front that occurred during glacial conditions. Glaciations become longer after MPT and long and strong deglaciations are followed by abrupt glacial/ interglacial transitions. Interglacials for the last 1 Ma were characterized by warmer climates before and after MPT. SST record clearly shows a strong dependence of the insolation forcing controlled by the main Earth's orbital parameters.

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THE DIVERSITY OF MILLENNIAL-SCALE COOLING EVENTS IN SOUTHWESTERN EUROPE DURING MIS 11

Oliveira D^{1,2,3,4}, Desprat S^{1,2}, Rodrigues T^{3,4}, Naughton F^{3,4}, Hodell DA⁵, Trigo R⁶, Abrantes F^{3,4}, Sánchez Goñi MF^{1,2}

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Climate and vegetation of southern Europe are particularly sensitive to present and future global climate changes. The Marine Isotope Stage (MIS) 11, which is characterized by muted insolation changes, has recently been highlighted as a warm stage with higher than present-day sea-level, most likely related to Greenland and West Antarctic ice-sheet collapse. Consequently, sedimentary archives of MIS 11 may provide valuable information on the abrupt climate variability in southern Europe under non-anthropogenic forcing.

We present a new direct land-sea comparison of MIS 11 from the IODP Site U1385, “Shackleton Site”, on SW Iberian margin. Our study documents with an unprecedented high time-resolution, the SW European vegetation and subtropical North Atlantic sea surface temperature (SST) changes to millennial-scale climate variability during MIS 11. This multiproxy approach reveals that climate instabilities are a pervasive feature of MIS 11 in SW Europe, but most importantly it highlights the diverse expression of the cooling events in terms of magnitude, character and duration. We propose that this diversity relies on atmospheric and oceanic processes whose predominant role likely depends on baseline climate states. Repeated atmospheric shifts recalling the positive North Atlantic Oscillation mode, inducing dryness in SW Iberia without systematical SST changes, would prevail during low ice volume conditions. Mechanisms associated to ice-sheet dynamics, such as magnitude and origin of iceberg discharges, related AMOC perturbation and

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regional precipitation would be critical to produce enhanced cooling and drying episodes of extended duration in SW Europe.



PAST CIRCULATION ALONG THE WESTERN IBERIAN MARGIN: A TIME SLICE VISION FROM THE LAST GLACIAL TO THE HOLOCENE

Salgueiro E^{1,2}, Naughton F^{1,2}, Voelker AHL^{1,2}, de Abreu L³, Alberto A³, Rossignol L⁴, Duprat J⁴, Magalhães VH^{1,5}, Vaqueiro S³, Turon J-L⁴, Abrantes F^{1,2}

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Fifteen Iberian margin sediment cores, distributed between 43°12'N and 35°53'N, have been used to reconstruct spatial and temporal (sub)surface circulation along the Iberian margin since the last glacial period. Time-slice maps of planktonic foraminiferal derived summer sea surface temperature (SST) and export productivity (P_{exp}) were established for specific time intervals within the last 35 ky: the Holocene (Recent and last 8 ky), Younger Dryas (YD), Heinrich Stadials (HS) 1, 2a, 2b, 3, and the Last Glacial Maximum (LGM). The SST during the Holocene shows the same latitudinal gradient along the western Iberian margin as present-day with cold but productive areas that reflect the influence of coastal upwelling centers. The LGM appears as a slightly less warm, but more productive period relative to the Holocene and present-day conditions, suggesting that sea-level minima forced a westward displacement of the coastal upwelling centers possibly accompanied by a strengthening of northward winds. During the YD, a longitudinal thermal front is depicted at 10 °W, with cold polar waters offshore and warmer subtropical waters inshore, suggesting that the subtropical Paleo-Iberian Poleward Current more likely flowed at a more inshore location masking the local SST signal and amplitude of variation. A substantial cooling

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and drop in productivity is observed during all HS, in particular HS1 and HS3, reflecting the penetration of icebergs-derived meltwater. These most extreme southward extensions of very cold waters define a strong SST gradient that marks a possible Paleo-Azores Front. Higher production south of this front was likely fed by frontal nutrient advection.

This work received national funds through FCT - Foundation for Science and Technology through project CCMAR/Multi/04326/2013, fellowships SFRH/BPD/26525/2006 and SFRH/BPD/111433/2015 to E.S., and SFRH/BPD/36615/2007 and SFRH/BPD/108712/2015 to F.N. The authors also wish to thank R. O'Malley and M. Behrenfeld for the satellite data. E.S. and A.V. also had support from EU COST Action ES0907 INTIMATE.

CLIMATE VARIABILITY ACROSS THE LAST DEGLACIATION IN WESTERN IBERIA AND ITS MARGIN

Naughton F^{1,2,3}, Rodrigues T^{1,2}, Salgueiro E^{1,2}, Sanchez Goñi MF³, Desprat S³, Costas S⁴, Gomes S⁵, Bronk-Ramsey C⁶, Duprat J⁷, Michel E⁸, Rossignol L⁷, Zaragosi S⁷, Prabhu, CN⁹, Oliveira D^{1,2,3}, Voelker AHL^{1,2}, Abrantes F^{1,2}

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The direct comparison between marine and terrestrial data from W Iberian margin (cores MD03-2697 and D13882) allows us to accurately evaluate, without chronological ambiguity, the vegetation response to North Atlantic (NA) climate events across the last deglaciation. Comparison of these data

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with other marine and terrestrial records from a vast area stretching from the Azores to W France, Iberia and its margin, W Mediterranean and NW Africa reveals the importance of enhanced winter NA westerlies episodes in driving

a heterogeneous regional climatic signal during last deglaciation particular events.

Heinrich Stadial 1 (HS1) is a complex event marked by 3 main phases (1: extremely cold/relatively wet; 2: cool/dry; 3: relatively warmer/increasing moisture availability) in regions directly influenced by the NA while it is characterized by a single phase (cold and dry) in most inland and high altitudes areas. HS1 complex pattern in W Iberia cannot be only explained by the reduction of the Atlantic Meridional Overturning Circulation (AMOC).

Changes in the strength and position of NA westerlies could explain the spatial variability in moisture during HS1 from W Pyrenees to W Mediterranean. The Bølling-Allerød (B-A) event is marked by a progressive increase of ocean and atmospheric temperatures and precipitation from the Bølling to the Allerød in W Iberia and W Pyrenees contrasting with the Greenland temperature pattern. Mid- to high latitudes thermal contrast and the gradual strengthening of the AMOC triggered the continuing enhancement of westerlies, and moisture, along this period. The Younger Dryas (YD) is characterized by a land-ocean synchronous returning cold conditions and, although dry conditions persisted during this period, extreme winter precipitation occurrences might have affected the most coastal areas of north and central W Iberia and Pyrenees. The westerlies migrated further north following the displacement of the thermal Front during the deglaciation precluding the input of moisture in the W Mediterranean region, which persisted very dry during the YD Stadial.

CLIMATE CHANGE DECOUPLES OCEANIC PRIMARY AND EXPORT PRODUCTIVITY AND ORGANIC CARBON BURIAL

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One of the biggest concerns among the scientific community dealing with climate change, is trying to assess the ecological consequences when facing a warming of the oceans. Here we studied one of the major coastal upwelling systems, located in the Oregon-California margin, regarding the changes in the carbon burial in marine sediments during the Holocene warming. Although the studied system is located in the Pacific, similar findings were reported in the African system (Canary current). We found that during warming, more carbon is buried in the sediments despite the lower primary productivity and that this relationship is not linear. If in one hand the possibility of increasing the efficiency of the biological pump with warming pleases some, on one hand, one cannot ignore that the increase in ocean acidity is of great concern.

These conclusions were based on organic carbon reconstructions from diatom transfer functions development. This new proxy development included

the building and new application of mathematical equations that were validated and calibrate under modern conditions. Therefore, for the first time, measurements of organic carbon content from the sediments can be compared with their surface fluxes for this study area and for the past 30000 years. This lead study is now being applied as a base for further investigations not only in the North Pacific but also in the North Atlantic.

This study received national funds from FCT - Foundation for Science and Technology through projects PDTC/AAC-CLI/112189/2009 and UID/Multi/04326/2014.

CORAIS DE ÁGUAS FRIAS REVELAM VARIAÇÃO DA CIRCULAÇÃO INTERMÉDIA DURANTE O ÚLTIMO CICLO CLIMÁTICO NA ZONA SE DO GOLFO DO MÉXICO

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Os padrões de circulação oceânica têm sofrido reorganizações cíclicas nos últimos 2 milhões de anos, em muito relacionados com a variabilidade

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climática, nomeadamente com os ciclos glaciares. O estudo da variação dos padrões de circulação no passado pode ser realizada a partir da análise de indicadores (*proxies*). Para a reconstrução das alterações oceanográficas das águas intermédias, um dos *proxies* usados são os corais de águas frias (CAF) duros (Ordem Scleractinia), que vivem maioritariamente a essas profundidades. Os CAF têm esqueletos de aragonite datáveis (^{14}C , U/Th, etc) e são facilmente preservados nos registos geológicos, podendo assim definir-se os seus períodos de ocorrência no passado.

A norte do Estreito do Iucatão, no Golfo do México, foi recentemente descrita uma grande área (>40 km²) de ocorrência de CAF denominada Província de CAF do Banco de Campeche. A Província situa-se a 480-600m de profundidade e é composta por montes íngremes e alongados, com 20-40m de altura máxima. A densidade de CAF é superior no cume dos montes, onde a comunidade é dominada por *Lophelia pertusa*. Na hidrografia local, foi registado um forte contraste de densidade, que ocorre à mesma profundidade da Província de CAF, na confluência da Água Intermédia da Antártida (AAIW) e da Água Subtropical Intermédia do Atlântico Norte (STUW). O contraste de

densidade está relacionado com a ocorrência de ondas internas, importantes como mecanismo de aumento da disponibilidade alimentar para os CAF.

Durante os últimos 250 mil anos, os CAF na Província de Campeche ocorrem maioritariamente em períodos interglaciares. O estudo das condições ambientais, realizado para os últimos 130 mil anos, revela uma relativa estabilidade nos fatores considerados, nomeadamente na disponibilidade de alimento, ventilação e intensidade de correntes de fundo. Os resultados sugerem uma alteração na distribuição das massas de água locais no último ciclo glacial-interglacial, o que terá afetado a ocorrência de ondas internas. A ausência de ondas internas durante o último glacial terá afetado negativamente o desenvolvimento dos CAF na Província de Campeche.



Oceanografia Geológica

ICEBERG PLOUGH MARKS IN THE ESTREMADURA SPUR POCKMARKS FIELD

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The Portuguese Margin has a particular paleoclimatic and palaeoceanographic interest as it is located at a latitude where glacials/interglacials climatic oscillations result in significant regional climatic changes. This margin includes the southward displacement of the glacial Polar Fronts. During Heinrich Stadials, the penetration of icebergs derived meltwater at the Portuguese Margin (~ 40°N) has been inferred by: abrupt cooler Sea surface temperatures; higher abundance of polar planktonic foraminifera species; abundance of IRDs; and drops in sea-surface paleo-productivity (Abrantes, 2001; de Abreu et al., 2003; Salgueiro et al., 2010, 2014; Abrantes et al., 2012).

Recently, a pockmarks field was discovered in the Estremadura Spur outer shelf (Kim et al., 2016). High-resolution single channel Sparker seismic lines reveals several episodes of fluid migration and fluid escape occurred during the Pliocene-Quaternary, as expressed by the presence of buried and recent pockmarks (Duarte, 2015). Two of those pockmarks were recently inspected with ROV, during the EMEPC-ROV Luso 2015 cruise, and together with the seismic interpretation indicates that at the present-time those pockmarks do not show signs of seepage activity.

Within the framework of the PES project, a compilation of the available swath bathymetry and backscatter data show the presence of more than 50 seafloor depressions in the Estremadura Spur. Most of those are clearly identified as pockmarks, resulting from the seepage of fluids (gas) that migrate from deeper parts of the basin. However, some depressions are bounded by topographically positive rims, elongated mounds and singular elevations that are not characteristic of pockmarks but instead typical of iceberg plough

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marks. Large furrows are also observed and attributed to the ploughing action of drifting icebergs.

These iceberg plough marks confirm the paleo-proxies that point to the presence of drifting icebergs. They confirm in situ the presence of large drifting icebergs at 39°N on the Portuguese Margin that are, to our knowledge, the southernmost occurrences of Iceberg plough marks in the Northern Hemisphere.

Acknowledgements: This work was developed as part of the PES project - Pockmarks and fluid seepage in the Estremadura Spur: implications for regional geology, biology, and petroleum systems (PTDC/GEOFIQ/5162/2014) financed by the FCT. This publication and the presentation of this work supported by project FCT UID/GEO/50019/2013 - Instituto Dom Luiz. Support by Landmark Graphics Corporation via the Landmark University Grant Program is also acknowledged.



Oceanografia Costeira

OCEANOGRAFIA COSTEIRA E DINÂMICA LITORAL

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As praias naturais não requerem protecção em relação às forças da natureza. Sem o impacto humano, a praia estará sempre em boa forma, embora em consequência de temporais possa mudar de forma ou deslocar-se para outro local. São sobretudo as acções da engenharia costeira que pretendem estabilizar o litoral e manter a linha de costa, dado que o seu objectivo é proteger as praias frontais aos edifícios e garantir as boas condições de entrada e saída dos portos.

O relatório do Grupo de Trabalho do Litoral (2014) recomenda para o litoral português que se privilegiem as medidas de reposição do equilíbrio sedimentar nos troços costeiros com maior risco de galgamento, inundação e erosão recorrendo a alimentações pontuais de elevada magnitude. No entanto o relatório considera também que o conhecimento actual é claramente insuficiente para caracterizar a situação actual e a dinâmica litoral portuguesa. Os princípios básicos que servem para explicar a natureza das praias e as suas modificações constituem a base da dinâmica litoral. Walter H. Munk and Melvin e A. Traylor publicaram no "The Journal of Geology", em 1947, o artigo "Refraction of Ocean Waves: A Process Linking Underwater Topography to Beach Erosion", e Douglas Inman fundador da oceanografia costeira no Scripps, publicou na revista Science em 1973 um artigo sobre os desafios do conhecimento do litoral "The Coastal challenge".

O comportamento das costas não pode ainda ser previsto com a precisão necessária. Os modelos numéricos actuais são simplificações grosseiras da realidade e regra geral as previsões do comportamento futuro da linha de costa podem ajustar-se aos requisitos dos projectos de protecção dependendo dos orçamentos disponíveis.

É imprescindível avaliar a deriva litoral em cada local, saber de onde vem a areia das praias, como evolui o perfil das praias, quais as células litorais e as suas limitações e como e porquê variam os orçamentos sedimentares. Para isso é preciso dinamizar e incrementar a oceanografia operacional no litoral muito para além das visões integradas baseadas em modelos muito simplificados.

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Oceanografia Física

NUMERICAL SIMULATION OF SEA LEVEL ANOMALIES INDUCED BY ATMOSPHERIC PERTURBATIONS

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The weather influence the regular tidal movements of the seas, exchanging energy between the atmosphere and the oceans at all space and time scales. An example of weather-driven movements with periods from several minutes to several days is storm surges. At the same time, changes in the atmosphere can generate sea level oscillations with smaller frequency scale with periods of a few minutes to a few tens of minutes, called meteotsunami.

Within this work two 2010 events, a storm surge and a meteotsunami, occurred at the Portuguese coast are numerically simulated through an atmospheric and an ocean model, the Weather Research and Forecasting Model (WRF) and the Regional Ocean Modelling System (ROMS), respectively. The atmospheric pressure perturbations and wind field simulated and output by WRF are imposed as sea level forcing agents in the ocean model ROMS. The numerical results are compared to sea level observations recorded by tide gauges.

For the storm surge event the model slightly underestimate the maximum sea levels recorded, increasing the deviation considerably when a meteotsunami was simulated. A contributing factor to these higher errors for the meteotsunami simulation might be the fact that the meteorological fields that induce this event are more unpredicted and chaotic than those that induce a storm surge.

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ESTIMATION OF THE ATLANTIC-MEDITERRANEAN NETFLOW VARIABILITY: FROM SUBINERTIAL TO INTER-ANNUAL TIME-SCALES

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The exchanges through the Strait of Gibraltar regulate salt, mass and heat fluxes of the semi-enclosed sea. Although estimates of the netflow are present in literature, longer term studies of the two-way baroclinic exchange are scarce. Furthermore, studies focus on seasonal to inter-annual scales whereas subinertial, from days to a few months fluctuations tend to be disregarded. How the flow through the strait has been driven in the last decades, from the subinertial to the inter-annual scales, and its repercussions in the circulation of the adjacent sub-basins are still open questions we aim to answer.

To estimate the netflow, we propose a new simulation for the Mediterranean Sea and Northeast Atlantic ocean domain with representation of the Strait of Gibraltar. We aim to hindcast the netflow variability for the last 36 years (1979 – 2014). Within the considered time scales the netflow is driven by water loss to the atmosphere in the Mediterranean basin, plus atmospheric pressure fluctuations and winds. These terms will be used in the future to force our simulation. First model tests, i.e., model response to sea level pressure fluctuations over the Mediterranean and its ability to simulate the subsequent netflow have been made. We expect to quantify how much sea level pressure fluctuations and winds over Mediterranean can affect the netflow variability.

We also present a comparison between observations, reanalysis and combined products for evaporation and precipitation over the Mediterranean Sea. On seasonal to inter-annual scales the flow is essentially driven by the net evaporation contribution and consequently accurate fields of precipitation and evaporation are necessary to force our simulation. We conclude that ERA-Interim reanalysis is the most suitable product for Mediterranean Sea. Its time and space variabilities, both for evaporation and precipitation, are in close agreement with NOC 1.1 in-situ dataset for the common period (1980 – 1993). Era-interim evaporation is also in agreement with the satellite-based estimates of OAFUX for the same period (1979 – 2014).



PROCESSOS OCEANOGRÁFICOS E DISTRIBUIÇÃO ESPÁCIO-TEMPORAL DAS ÁREAS DE PESCA: UM CASO DE ESTUDO

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A tentativa de encontrar correlações entre processos oceanográficos e distribuições de recursos pesqueiros tem sido um tema recorrente na investigação científica. Em Portugal, a falta de dados com cobertura espacial e temporal apropriada tem impedido o desenvolvimento deste tipo de análise. Este constrangimento foi recentemente mitigado com a entrada em funcionamento da rede operacional de radares costeiros de alta frequência, capaz de fornecer de forma contínua dados de corrente de superfície, que são fundamentais para a identificação dos padrões de circulação na plataforma interna. Combinando esses dados com resultados de modelos numéricos, dados de satélite e registos georreferenciados de atividade de pesca é possível proceder à caracterização ambiental de algumas áreas de pesca. Foram estudados padrões de circulação através de experiências lagrangianas resultantes da integração dos campos superficiais de correntes obtidos por modelos numéricos e dados de radares costeiros de alta frequência. A possível aplicação de modelos de dispersão de partículas mais avançados (p.ex. Ichthyop) é discutida através da análise das zonas de convergência e divergência.

Os resultados serão discutidos a partir do estabelecimento de relações entre processos oceanográficos considerados relevantes e dados de atividade de pesca.



DESCARGAS DE ÁGUAS SUBTERRÂNEAS NOS OLHOS DE ÁGUA (ALGARVE) – RESULTADOS DAS CAMPANHAS CTD

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Este trabalho de investigação foi realizado no âmbito do Projeto de I&D “FREEZE – Submarine FREshwater dischargEs: characterIZation and Evalutation study on their impact on the Algarve coastal ecosystem” que teve como objetivo principal o estudo das descargas de águas subterrâneas (DAS) na plataforma continental do Algarve, nos Olhos de Água, região caracterizada pela existência de nascentes de água doce na praia e também no mar.

Realizaram-se 3 campanhas oceanográficas com uma malha de estações relativamente densa em Novembro de 2012 (59 estações), Abril de 2013 (42 estações) e Novembro de 2013 (65 estações). Na totalidade, completaram-se 166 estações CTD, com profundidades compreendidas entre 2 e 30 m. Face às reduzidas dimensões da embarcação utilizada nas campanhas, a área de estudo ficou restringida à distância máxima de 3 milhas náuticas (≈ 5,6 km) da costa.

Os perfis de temperatura, de salinidade e de sigma-t, e os diagramas T/S de cada uma das estações permitiram identificar 3 assinaturas distintas: as estações oceânicas costeiras, as estações com influência de DAS encontradas a diferentes profundidades e as estações em que o sinal das DAS está presente na totalidade da coluna de água.

As maiores variações de salinidade e de temperatura encontradas nos perfis ocorreram durante a campanha realizada em Novembro de 2013, indicando maiores descargas de águas subterrâneas, o que está de acordo com um ano hidrológico relativamente chuvoso como foi o de 2012-13.

A análise conjunta das secções paralelas e perpendiculares à costa e das distribuições em superfícies tornaram possível a identificação/localização de algumas saídas de DAS a profundidades que poderão corresponder a antigas linhas de costa.



FLOWS AROUND THE AZORES PLATEAU: EVIDENCE OF INTERMEDIATE DEPTH CLOSED CIRCULATIONS

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Evidence of significant flows at Labrador intermediate water levels along the eastern side of the Azores Plateau has been reported in a few papers. The possibility of a closed circulation associated with the interaction of the Gyre-scale flow with the plateau (Island effect) has also been suggested in theoretical modelling.

We use float data (subsurface acoustic buoys and ARGO profilers), surface drifters and current meter time series to study of the circulation at intermediate and surface levels.

There is clear evidence of closed streamlines in circulations derived from ARGO data at intermediate levels. The pattern is not so clear when using other drifters. The eastern branch of this flow, however, is particularly striking across all data. At the surface the closed circulation is not observed. Explanations for the existence of such flows are discussed.

CIRCULAÇÃO COSTEIRA NO BARLAVENTO ALGARVIO NO VERÃO DE 2015

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Neste trabalho são analisadas soluções de modelos hidrodinâmicos para o barlavento Algarvio e observações da corrente costeira realizadas entre Julho e Novembro de 2015. As medições foram efectuadas com um ADCP fundeado a cerca de 1 milha ao largo da Ponta da Piedade, à profundidade de 30 m. Os dados mostram a predominância da corrente dirigida ao longo da costa, alternando entre períodos de corrente de Oeste e corrente de Levante, com durações típicas entre 2 e 5 dias. As correntes dirigidas para leste ocorrem

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geralmente durante os períodos de vento dos quadrantes norte/oeste e em sentido contrário em períodos de vento fraco, de sul ou de

leste. A comparação com soluções publicamente disponíveis de diferentes modelos numéricos revela disparidades entre os modelos e as observações, especialmente nos níveis mais próximos do fundo. A análise centrada nos eventos de corrente com intensidades superiores a 0.1 m/s, e com duração superior a um dia, mostra que também existem diferenças importantes entre as soluções dos vários modelos no que respeita à intensidade, duração e estrutura vertical das correntes.

CONNECTING PATHWAYS ACROSS THE NORTHEAST ATLANTIC OCEAN

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The first Lagrangian particle study attempted to map the generalized transport pathways of the northeast Atlantic Ocean used the Regional Oceanic Modeling System to calculate ocean current velocity components (u , v , w), and 'Ariane' (an off-line Fortran code dedicated to the computation of three-dimensional streamlines from velocity fields) to calculate the transport of particles around the numerical model domain. Four main transport layers were identified (0-10 m, 20-200 m, 300-500 m, and 600-2000 m), consistent with known connectivity and drifting patterns. Particles released in the Azores Archipelago had a broad reach, thus a second study was centred on these islands. The Hybrid Coordinate Ocean Model coupled with the Connectivity Modeling System was used to pursue the Azores study, together with analysis of Lyapunov exponents, and Eddy Kinetic Energy from altimetry. The Gulf Stream (GS) and the westward propagating eddy corridor off the Azores Current were identified as the main transport pathways affecting the Archipelago. In the upper mixed layer, the GS and its associated eddies and filaments are a

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predominant regional oceanographic feature injecting particles from the north and west boundaries onto the Azores. The same methodology was also used to extend the Azores study to two regional seamount groups: Great-Meteor and Madeira-Tore. Results enhance the different dynamical nature of the ocean currents affecting the two seamount-groups as well as

limiting physical connectivity between them. Connectivity between seamounts of the same group can also be sparse. Future in situ studies in the scope of the 'Biometore' project should help validate these numerical calculations.

Oceanografia Biológica

EXPLORING THE SUBMARINE CANYONS' SCIENTIFIC LANDSCAPE: VISUALIZING WHAT WE KNOW

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The submarine canyons are among the geomorphologic structures most studied in the deep-sea. More than 5000 large canyons were identified worldwide. In a fraction of those, numerous studies across disciplines have been conducted, covering several structural and functional aspects of its nature and revealing their remarkable influence in the surrounding areas. Despite the vast literature published, the canyons scientific landscape delimitation is still missing although the valuable information that the study of past and present epistemic trends can yield. Most of the literature is available in the electronic format allowing its analysis by powerful textual retrieval techniques. Text mining offer powerful tools to organize, classify, label and retrieve previously unknown data patterns from text collections. The INCISE canyons database was updated with the corresponding abstract to extract the most relevant terms. Extraction of terms was made using natural language processing (NLP) methods and the subsequent epistemic analyses were

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performed based on the frequency of terms occurrence. All the NLP tasks and co-word analyses were performed using the tools available in the online CORTEXT platform. In addition, the Gephi program was used to map the canyons scientific landscape while complementary analyses and data visualization processing were ran using R. Despite language ambiguity in

multidisciplinary co-word analysis may be criticized, these studies provide systematized and useful information to the scientists and science managers. In this study we addressed three main issues: 1) determine the main knowledge clusters of canyon research and how they are interconnected; 2) identify which are the canyons and scientific subject categories well-covered in literature and where are the main knowledge gaps in canyon research; and 3) reveal the dynamics and historic evolution of canyons' science landscape. The scientific landscape mapping and its complementary results will be available online in the near future, as an open interactive platform that can be used by canyon stakeholders as a tool for a better planning of future research, management actions and funding allocation.

LARVAL DISPERSAL IN THE GULF OF CADIZ: A MODELLING EXERCISE FOR THE MARBLED ROCK CRAB *PACHYGRAPSUS MARMORATUS*

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The common coastal crab *Pachygrapsus marmoratus* occurs in rocky shores of the northeastern Atlantic and Mediterranean. The long planktonic larval phase of the species is still incompletely described and, besides the megalopa (last larval stage), only the first six zoeal stages are known, lasting around 30 days. Several studies report the release of *P. marmoratus* larvae in the intertidal area and a shelf exportation where the development is completed.

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During a summer oceanographic survey along the southern Portuguese coast, in situ data consisting on CTD casts and plankton hauls were obtained. In the collected samples, the first five zoeal stages and megalopae were captured. Results showed larvae progressively farther from the coast with each larval stage and megalopae close to the coast. The mechanisms used by megalopae to return to adult habitats were explored using a modelling approach. Ecological parameters - vertical distribution, points of larval release, larval duration - were integrated in the simulations to understand the influence of vertical migrations and ocean circulation on the dispersal range of *Pachygrapsus* larvae. Similar studies addressing the dispersal of other decapod species in the Gulf of Cadiz area will also be presented.

NEW INSIGHTS ON DEEP-SEA FISH COMMUNITY STRUCTURE ALONG ENVIRONMENTAL GRADIENTS

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Understanding the mechanisms supporting community structure is a major topic in ecology. Incorporating information of population dynamics and species-specific traits with stable isotope information enables us to test ecological hypotheses.

Continental slopes present highly diverse marine ecosystems, which are influenced by strong environmental depth-related gradients. Food availability is among the factors responsible for depth-related trends in community structure and patterns of biomass and diversity along continental slopes. Deep-sea fishes are supported by food provided by both physical (sinking fluxes) and biological (controlled by vertically migratory organisms) processes, but the relative importance of these pathways, and their roles in shaping trophic niches remain poorly known.

In this study we report results of an extensive survey of demersal fish communities recovered between 500 and 2000m water depth on the North East Atlantic (Scottish and Irish) continental slope. We used simple bulk carbon and nitrogen data and Bayesian-based models to track nutrient pathways and trophic niches for 48 deep-sea fish species in relation to depth along the continental slope. We show that both benthic and pelagic nutrient pathways fuel fish communities; at 500m, benthic-pelagic coupling is remarkably strong, driven by impingement of vertically-migrating fauna on the seafloor, followed

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by an increased separation between these pathways with increasing water depth.

The effect of increasing depth (and decreasing benthic-pelagic coupling) on isotopic niche space reflects how depth-trends of trophic specialisation vary across functional groups. Benthic species have broader isotopic niche breadth but a decline in the proportion of total biomass with increasing depth, indicating a gradual competitive release after 1500m. In contrast, we found that benthopelagic fishes tend to show a competitive release within a shorter bathymetric range (1500-1800m), but an increase in the proportional biomass with depth.

Finally, we show how information on isotopic niches provides key insights into the ecological mechanisms driving deep-sea ecosystem functioning.



POSTERS

P1. MEDITERRANEAN OVERFLOW WATER SIGNAL DURING THE PLIO- PLEISTOCENE TRANSITION: A NEW PERSPECTIVE FROM IODP SITE U1391

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The Plio-Pleistocene transition is characterized by a long term cooling shift from the warm Pliocene climate, with high greenhouse gases concentrations, to a colder climate in which a significant expansion of the ice cover in the Northern Hemisphere occurred and the climate alternation between glacial and interglacial periods became more pronounced. Several hypotheses have been put forward to unravel the mechanisms that drove the intensification of the Northern Hemisphere glaciation, but this transition is still poorly understood compared to recent climate shifts such as the last deglaciation. Recently, it has been suggested that the Mediterranean Overflow Water (MOW) may have played a major role in this transition. MOW is a very important salt-contributing member to the North Atlantic deep water (NADW) and thermohaline circulation, and modelling studies indicate a close relationship between MOW's physicochemical characteristics and climate fluctuations. Sedimentary records from the last glacial cycle evidenced this link and suggested that the MOW injection of salty water to intermediate depths enhanced the upper branch of NADW, which ultimately reinvigorated the whole Atlantic Meridional overturning circulation (AMOC). Here we present the preliminary results of our sedimentological and paleontological analysis from Site U1391 (37° N; 9° W; 1085 m water depth), recovered on the Southwest Iberian margin during the Integrated Ocean Drilling Program (IODP) Expedition 339. This site is located in a plastered drift in the path of the MOW and offers high sedimentation rates to perform high resolution studies of past climatic and oceanographic conditions. The reconstruction of MOW flux as well as temperature oscillations in the Iberian margin through the Plio-Pleistocene

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transition will be compared with North Atlantic records of deep water formation to investigate the contribution of MOW to the

enhancement of AMOC, and its possible role in the initiation of the Northern Hemisphere glaciation.

P2. INSOLATION FORCING OF COCCOLITHOPHORE PRODUCTIVITY IN THE NORTH ATLANTIC DURING THE MIDDLE PLEISTOCENE

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Coccolithophores play a key role in the oceanic carbon cycle through their combined effects on the biological and carbonate pumps. Understanding what controls coccolithophores productivity is thus fundamental to better understand carbon cycling in the ocean. In order to investigate how coccolithophore productivity reacted to global climate change during the Quaternary, a high-resolution record of coccolith Sr/Ca ratio, an indicator for coccolithophore productivity, was generated for the North Atlantic IODP Site U1313 (41.00°N, 32.58°W) across Marine Isotopic Stages 16 to 10 (638 to 356 ky), straddling the mid-Brunhes dissolution event and the *Gephyrocapsa caribbeanica* acme. The age and location of the record allow investigating processes affecting productivity at mid-latitude settings and disentangling the effects of atmospheric CO₂, temperature and regional ocean circulation. The dominant feature of the reconstructed coccolithophore productivity is a glacial-interglacial cyclicity with higher productivity during glacials. The record reveals that coccolithophore productivity at the studied site was not stimulated

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by atmospheric CO₂ fertilization and seems to have been decoupled from sea surface temperature. Instead, the reconstructed productivity appears to reflect the migration of the North Atlantic high productivity zone currently located between 45 and 55° N. Spectral analysis of the Sr/Ca-based productivity

record confirms a dominant ~100 ky pacing but also reveals significant spectral power near 14 ky and 9 ky. The occurrence of this high-frequency component in the spectrum of the reconstructed productivity is consistent with forcing by insolation maxima superimposed on the pattern of front migration over the studied site. In analogy with the present-day phenology of coccolithophore blooms in the North Atlantic, early Pleistocene coccolithophore productivity was enhanced during interglacials when insolation was at its maximum either in spring or in fall, whereas during glacials, productivity was enhanced only when summer/autumn insolation was at its maximum.

P3. STUDY OF EARLY SUMMER MESOSCALE STRUCTURES AND PROCESSES OF NW IBERIAN MARGIN

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The hydrography and dynamics of NW Iberian margin in the neighborhood of Cape Silleiro were explored for July 2009, based on a set of in situ and remote sensing observations.

Usually, filaments develop near Cape Finisterre and at 42°N in July and grow until the end of August. During July 2009, anomalous atmospheric conditions brought southerly winds and precipitation. In this way upwelling was not sustained long enough to produce fully developed filaments in the region. Nonetheless, two periods of northerly winds were enough to form an upwelling front extending to the shelf edge, just south of Cape Silleiro.

Zonal sections of standard CTD casts, towed CTD (SeaSoar), Vessel Mounted Acoustic Doppler Current Profiler (VMADCP), and Lagrangian surveys were made, in order to characterize the early stages of upwelling in this region,

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which is key to the origin of filaments. High-resolution VMADCP and SeaSoar offshore surveys revealed a poleward flow with a signature in the satellite Sea Surface Temperature. This flow was associated with mesoscale eddies which interacted with the coastal waters and the shelf topography. Those interactions appear to be responsible for the main forcing mechanisms of the small scale filaments observed in this study. Ongoing numerical model simulations for the same period will contribute to further understanding of upwelling dynamics and filament development in this region.

P4. ANÁLISE DA INFLUÊNCIA DAS CONDIÇÕES HIDROMETEOROLÓGICAS SOBRE OS DESASTRES NATURAIS NO LITORAL PARANAENSE

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Este estudo busca entender as influências das condições do tempo com ênfase na chuva nos eventos de desastres naturais ocorridos no litoral paranaense, município de Antonina e Guaratuba, no período entre 2000 e 2012. Para esse período foram obtidos 10 eventos de desastres junto à Biblioteca Pública do Paraná. Foi utilizado a Análise de Componentes Principais (ACP) para identificar um padrão de comportamento para tentar explicar a ocorrência de desastres naturais provocadas pelo elevado índice pluviométrico com inundação com ou sem deslizamento de encostas. Os 10 eventos foram separados em dois grupos: 5 com deslizamento (CD) e 5 sem deslizamento (SD) de encostas. Os dados meteorológicos das estações de Antonina e Guaratuba foram fornecidos pelo SIMEPAR e utilizados nas ACPs. Os seus resultados mostraram que durante os eventos CD, as condições atmosféricas mantiveram-se menos oscilantes por um período de tempo maior comparadas aos eventos SD, sendo que a precipitação apresentou menor variabilidade nos eventos CD. A radiação solar, a temperatura atmosférica e a umidade relativa foram as variáveis com maior variação durante os desastres. A pressão atmosférica, direção do vento mantiveram-se mais constantes durante desastres naturais causadas por eventos de chuvas intensas.

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P5. CONNECTING DOTS ACROSS MEDITERRANEAN SEASCAPE: THE ROLE OF SUBMARINE CANYONS ON *LOPHELIA PERTUSA* CONNECTIVITY

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The importance of submarine canyons in the benthic and pelagic ecosystem functioning has attracted the scientific attention in the recent years. Awareness on the need for protection and conservation of various habitats occurring in canyons, such as the cold-water corals classified as Vulnerable Marine Ecosystems, has grown progressively with our perception of the anthropogenic impacts. Canyons occur in the Mediterranean Sea in high number and they are more closely spaced here than in other areas of the world which may be a crucial factor for the connectivity of their communities. Knowledge on the spatial dynamics and limitations of this key process for community resilience and metapopulation persistence is fundamental for implementing effective conservation measures. Being a sessile species when adult and having a larval dispersal stage, *Lophelia pertusa* is an attractive species to model connectivity in the deep sea. Understanding the importance of the seascape configuration on the *L. pertusa* connectivity is the main objective of this work. A multidisciplinary approach is used to assess the role of habitat availability and suitability in the dispersal capability of the species. We integrated habitat suitability and biophysical dispersal modelling with graph analysis in order to explore the interaction between the seascape (habitat structure and oceanography) and *L. pertusa* potential connectivity. Graph-based analysis emerged in ecology as a promising tool to study the functional and structural connectivity. The habitat suitability map was produced using MaxEnt, a niche ecological model, and the biophysical output was obtained with the lagrangian-based system "Connectivity System Model". A geographically explicit network was generated based on the potential connectivity output and the relative importance of the habitat patches in the seascape configuration was analysed. The network analysis allows the characterization of the spatial structure of population sources and sinks, the occurrence of corridors or barriers and provides hypotheses on *L. pertusa* connectivity across the Mediterranean, which can be empirically tested.

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P6. VEGETATION AND CLIMATIC CHANGES DURING MIS 31 IN SOUTHWESTERN EUROPE

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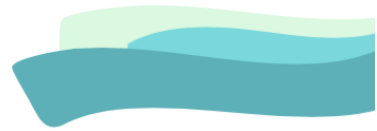
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Discriminating natural from anthropogenic forcing is essential to understand the natural climate variability of past warm intervals that occurred under a wide array of baseline climatic states (insolation/orbital parameters, ice-sheet extent and greenhouse gases). Marine Isotope Stage (MIS 31), c. 1.081–1.062 Ma, is of particular interest as it occurred when the dynamics of the East Antarctic ice sheet were dominated by ablation processes along with the expansion of the Agulhas leakage, a similar situation than that expected for the next century. This interglacial, which received the highest high-latitude insolation values of the last ~1.8 Ma, generally stands out as a long and warm interval in numerous paleoclimate records. In the Arctic region the magnitude of the warmth was so exceptional that MIS 31 has been considered as a “super interglacial”. However, due to the scarcity of studies key questions remain concerning not only the magnitude of the warming, but also the contribution of external (insolation) and internal (ice volume, greenhouse gases, ocean and atmospheric dynamics, vegetation) processes behind its natural climatic variability at orbital, millennial and sub-millennial timescales.

In the present study, we document for the first time the atmospherically-driven vegetation and climate changes during MIS 31 in a highly sensitive area to ongoing global climatic changes, the Mediterranean region. Based on a high time-resolution land-sea comparison of a marine sequence, the IODP Site U1385 (“Shackleton Site”) from SW Iberian margin, we will investigate the response of SW European vegetation and mid-eastern North Atlantic hydrological changes to the climate variability of this key interglacial stage. Unravelling the processes behind the natural climatic variability of MIS 31 will improve current knowledge about the evolution of our present warm interval,

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without human intervention, and on the mechanisms that push Earth's climate into glacial conditions.





P7. ENVIRONMENTAL CONTROL ON VERTICAL DISTRIBUTION OF PLANKTONIC FORAMINIFERA IN THE EASTERN NORTH ATLANTIC

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Planktonic foraminifera serve as an archive of physical and chemical conditions under which they built their shells. To make the most of their potential as paleoceanographic proxy it is important to understand their modern environmental preferences. A particularly important aspect of the ecology of planktonic foraminifera is the depth habitat of individual species. To better understand the variability of this key parameter, the concentration of 36 species of living planktonic foraminifera was determined in vertically resolved plankton net samples collected in the region between 20° to 43°N and 8° to 40° W during several oceanographic campaigns from 1995 to 2012. Of the 36 species recorded, 28 occurred in sufficient abundance to allow us to quantify their vertical habitat with confidence. This was done by converting the species concentration values at each station to average living depth and its variance. These parameters allowed us to identify three groups of species showing different vertical habitats: 7 species were found to consistently live in the surface layer, with only one exception, there were no occurrences below 100 m; 13 species lived mostly from 20 m to approximately 200 m; and 8 species inhabited the water column from the surface to deeper than 200 m. An exception is *Tenuitella iota*, which was observed only below 200 m. About one half of the species showed a large spread in their average living depth among stations and for these species, we assessed whether their living depth can be predicted. To this end, we used a generalized linear model linking average living depth with mixed layer (ML) depth, temperature in the ML and chlorophyll a in the ML. Furthermore, the influence of seasonal and lunar cycle on the living depth was tested using a periodic regression. For *Globigerinella siphonifera* ML depth was significant while for *Globigerinita glutinata* ML depth and ML

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temperature seem to influence the living depth. Species like *Globorotalia inflata*, *Globorotalia hirsuta* and *Globorotalia scitula*



exhibit strong seasonal variation in their living depth whereas *Globigerinoides sacculifer* and *Turborotalita quinqueloba* seem to shift their living depth with the lunar cycle. In most of the studied species with variable average living depth, the variation could be predicted by a combination of ontogenetic and/or seasonal vertical migration and changing environmental conditions.

P8. BLUECOM+ project: Connecting Humans and Systems at Ocean Remote Areas using Cost-effective Broadband Communications field

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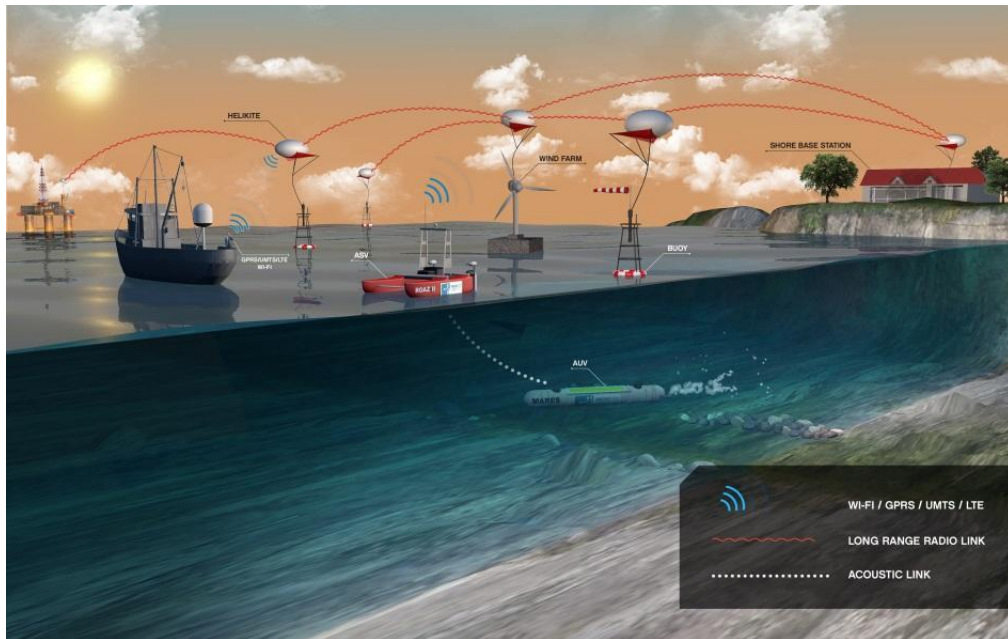
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BLUECOM+ is an EEA Grants PT02 project, involving INESC TEC, IPMA, and MARLO. The project aims at developing an innovative communications solution that will enable broadband, cost-effective Internet access at remote ocean areas (beyond 100 km from shore), using standard wireless access technologies (e.g., Wi-Fi and GPRS/3G/4G).

The BLUECOM+ key idea and innovation lies on deploying a long-term communications infrastructure, which will extend broadband communications from shore to remote ocean areas by leveraging (1) Helikites – a combination of a helium balloon and kite – that can be tethered to existing and new land and ocean platforms, (2) long range line of sight wireless communications, and (3) multi-hop relaying techniques to further increase range, as it is illustrated in the figure attached.



At this stage the communications protocols were defined and tested in lab conditions and the sea trials and demonstration of the system will be carried out in June and July using the IPMA research vessels *Noruega* and *Diplodus*.

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